THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 15

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DARRELL G. HILL, TIMOTHY S. HENDERSON, WILLIAM U. LIN, SHOU-KONG FAN, HIN-FAI CHAU, DAMIAN COSTA, and ALI KHATIBZADEH

Appeal No. 1997-3512
Application No. 08/482,034

ON BRIEF

Before THOMAS, GROSS, and LEVY, Administrative Patent Judges.
LEVY, Administrative Patent Judge.

## DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 17-23, which are all of the claims remaining in this application.

## BACKGROUND

The appellants' invention relates to a method of fabricating a bipolar transistor. Specifically, the step of providing a material structure includes a base structure (42)

having first (40) and second (44) layers having the same doping type (specification, page 5) and approximately the same doping concentration (specification, page 8). Representative claim 17 is reproduced as follows:

17. A method of fabricating a bipolar transistor, comprising the steps of:

providing a material structure including an emitter layer abutting a base structure, wherein said base structure comprises first and second layers of semiconductor having the same doping type and approximately the same doping concentration, said first layer having a wider bandgap than said second layer;

removing portions of said emitter layer to leave an emitter mesa on said base structure; and

forming base contact metallization on said first layer of semiconductor.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

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| Liu et al. (Liu) | 5,330,932 | Jul. 19, 1994 |
| Gaw et al. (Gaw) (EP) | 0 384 113 | Aug. 29, 1990 |

Claims 17, 18 and 20 stand rejected under 35 U.S.C. § 102(b) as anticipated by, or in the alternative, under 35 U.S.C. § 103 as obvious over Gaw.

Claims 19 and 21-23 stand rejected under 35 U.S.C. § 103. As evidence of obviousness, the examiner relies upon Gaw in view of Liu.

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellants regarding the above-noted rejections, we make reference to the examiner's answer (Paper No. 12, mailed November 5, 1996) and the final rejection (Paper No. 6, mailed February 29, 1996) for the examiner's complete reasoning in support of the rejections, and to the appellants' brief (Paper No. 11, filed September 6, 1996) for the appellants' arguments thereagainst.

## OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellants' specification and claims, to the applied prior art references, and to the respective positions articulated by the appellants and the examiner. As a consequence of our review, we make the determinations which follow.

Turning first to the rejection of claims 17, 18 and 20, we reverse the stated rejection of claims 17, 18 and 20 under

35 U.S.C. § 102(b) as anticipated by, or in the alternative, under 35 U.S.C. § 103 as obvious over Gaw.[1]

The focus of the dispute between the appellants and the examiner resides in the recitation that the step of providing a material structure includes first and second base layers having approximately the same doping concentration. The examiner states (final rejection, page 2) that in Gaw, both base layers have approximately the same doping concentration. We find that Gaw discloses the base layer (13), which is nearest to emitter layer (14), to have a different doping concentration than the doping concentration of the base layer (12) which is nearest to the collector (11). The issue, therefore, centers around whether the different doping concentrations of the two base layers are "approximately" the

[1] We note that in the examiner's Response to argument (answer, pages 3 and 4) the examiner refers to references to Tokui et al. and Nakagawa to support the examiner's position. No mention of these references is found in the rejections set forth by the examiner, nor are they referred to by appellants in the brief. Where a reference is relied on to support a rejection, whether or not in a minor capacity, that reference should be positively included in the statement of the rejection. *See In re Hoch*, 428 F.2d 1341, 1346, n.3, 166 USPQ 406, 407 n.3 (CCPA 1970). Accordingly, we have not considered these references in making our determinations under 35 U.S.C. 102(b) or 35 U.S.C.
§ 103.

same. The examiner argues (answer, pages 3 and 4) that the "p++" and "p" doping ranges of the two base layers define the whole range of well known doping concentrations, and that any point of doping concentration between these upper and lower bounds is therefore approximately the same doping concentration.

From our review of Gaw, we are not in agreement with the examiner's characterization of the doping concentrations of Gaw's base layers 12 and 13. We find that Gaw does not reasonably suggest that the two layers have approximately the same doping concentrations to the extent that they are both within the vicinity of lower and upper ranges of p and p++. To the contrary, Gaw is directed to a (page 2, col. 1, lines 6-9) "heterojunction bipolar transistor having a multilayer base structure, wherein the layer adjacent to the emitter is more heavily doped than the layer adjacent to the collector." Base layer (13) is a "highly doped" p-type layer "p++" in contrast to base layer (12) which is a "lightly doped" p-type layer "p." As further disclosed by Gaw (page 3, col. 4, lines 11-16), "It is believed that current flow is enhanced by the presence of an accelerating field generated by the wide band

gap, highly doped p-type GaAlAs layer 13 on top of narrow band gap, lighter doped p-type GaAs layer 12." In addition, Gaw states (page 3, col. 2, line 50 through page 4, col. 1, line 1) that "electrons which have entered base layer 13 are influenced by an accelerating field, caused by the potential difference between conduction band 23 and conduction band 25. Because band 25 is at a lower potential, the accelerating field acts to sweep electrons from layer 13 to layer 12. The magnitude of the accelerating field is a function of doping concentration differential and band gap differential between layer 12 and layer 13." As Gaw specifically provides for different doping levels to affect the magnitude of the accelerating field to enhance current flow, we cannot conclude that the doping levels of the two base layers are approximately the same. Accordingly, we will reverse the rejection of claims 17, 18 and 20 under 35 U.S.C. § 102(b).

With regard to the alternate rejection of claims 17, 18 and 20 under 35 U.S.C. § 103, the examiner relies upon the statement in Gaw (page 3, col. 1, lines 49-51) that "[m]ore specifically, first base layer 12 consists of a GaAs layer, with an acceptor concentration selected to meet desired device

characteristics." It is the examiner's position (final rejection, page 3; and answer, page 4) that it would therefore have been obvious to have selected the doping concentration of base layer 12 to be approximately the same or the same as layer 13 "as desired in order to meet device characteristics such as reducing the spreading resistance due to high doping concentration which, in turn, increases in [*sic*: the] operational speed of the transistor" (final rejection, page 3). The fact that Gaw discloses that the doping concentration of base layer 12 can be modified to meet device characteristics does not suggest the specific doping concentration of base layer 12 set forth in the claims. We find that Gaw teaches away from providing both base layers with approximately the same doping concentrations by specifically providing for a heavily doped layer on top of a lighter doped layer to affect the magnitude of the accelerating field in order to enhance current flow.

Appellants' position (brief, bridging pages 4 and 5)is that:

> Claim 17 is nonobvious over Gaw in part because that reference teaches away from the claimed invention. Gaw teaches away from any doping configuration other than that shown in Figure 1 by teaching that an

> "accelerating field acts to sweep electrons from layer 13 to layer 12." See col. 4, lines 50-58. Gaw goes on to say that "the magnitude of the accelerating field is a function of doping concentration differential and band gap differential between layer 12 and layer 13." To overcome this deficiency of Gaw, the Examiner refers to col. 3, lines 49-51, where Gaw states that layer 12 consists of a GaAs layer having a doping concentration "selected to meet desired device characteristics." But Gaw does not teach or suggest any desired device characteristics other than for the highly doped "p++" layer over the lighter-doped "p" layer. Absent any other teaching or suggestion, Gaw's comment concerning "desired device characteristics" is empty of meaning. Put differently, the accelerating field is the entire gist of Gaw's teaching, and its existence depends on the doping concentration differential. Therefore, one skilled in the art would not be motivated by Gaw to practice the invention described in Claim 17, which involves layers of approximately the same doping concentration. Indeed, the skilled artisan would be taught away from such a structure.

We are in agreement with appellants that Gaw does not teach or suggest any desired device characteristics other than the highly doped "p++" layer on top of the lighter doped "p" layer and that a skilled artisan would be taught away from making the two base layers with approximately the same doping concentration. Merely stating that the doping concentration of a layer may be selected to meet desired device characteristics is not sufficient to suggest a specific doping concentration that is contrary to the express teaching of the

reference. Accordingly, the rejection of claims 17, 18 and 20 under 35 U.S.C. § 103 is reversed.

With regard to the rejection of claims 19 and 21-23 as unpatentable under 35 U.S.C. § 103 over Gaw in view of Liu, we note that claim 19 depends from claim 17. In addition, independent claim 21, from which claims 22 and 23 depend, includes all of the limitations of claim 17 and additionally adds that the emitter layer is GaInP. Since Liu does not cure the deficiency of Gaw, the rejection of claims 19 and 21-23 as unpatentable under 35 U.S.C. § 103 over Gaw in view of Liu therefore falls for the same reasons as claim 17. Accordingly, the rejection of claims 19 and 21-23 is reversed.

## CONCLUSION

To summarize, the rejection of claims 17, 18 and 20 under 35 U.S.C. § 102(b)/103 is reversed. The rejection of claims 19, 21-23 under 35 U.S.C. § 103 is also reversed.

## REVERSED

| | | |
|---|---|---|
| JAMES D. THOMAS<br>Administrative Patent Judge | ) | |
| ANITA PELLMAN GROSS<br>Administrative Patent Judge | ) | BOARD OF PATENT APPEALS AND INTERFERENCES |
| STUART S. LEVY<br>Administrative Patent Judge | ) | |

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APPEAL NO. 1997-3512 - JUDGE LEVY
APPLICATION NO. 08/482,034

APJ THOMAS

APJ GROSS

APJ LEVY

DECISION: **REVERSED**

Prepared By: TINA

**DRAFT TYPED:** 25 Jan 01

**FINAL TYPED:**